

PARALLEL AND DISTRIBUTED SYSTEMS



Gary Lamont

Professor

PhD, University of Minnesota,
1970

- High Performance Parallel Computation
- Distributed Systems
- Evolutionary Algorithms
- Artificial Intelligence
- Data Mining

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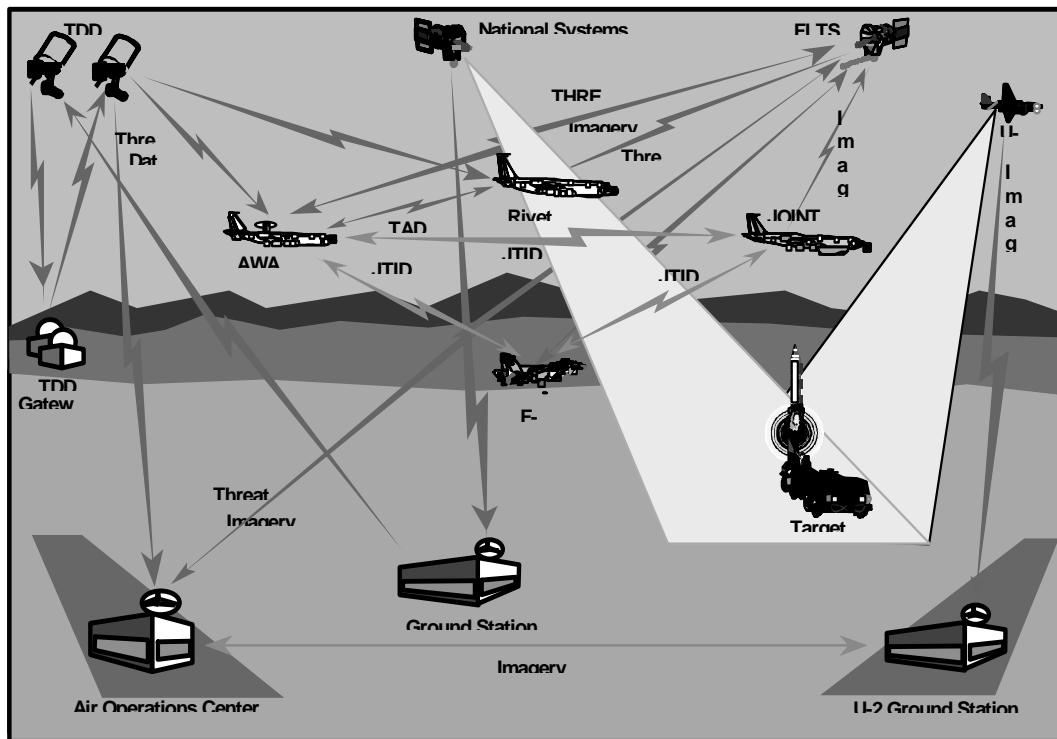
The AFIT Parallel and Distributed Computation Research Group emphasizes the development of efficient and effective parallel and distributed algorithms that solve scientific and engineering issues related to information systems of interest to the military.

Our general objective focuses on engineering intelligent parallel and distributed information systems. Such an effort integrates knowledge from various disciplines including computer engineering, electrical engineering, aerospace engineering, artificial intelligence, parallel and distributed computation, software engineering, information visualization and database systems. General research in parallel and distributed computation involves the continuing study of software development for high performance parallel computer architectures.

Specific research includes parallel and distributed digital signal processing, Domain-Specific Parallel Software Architectures, Parallel Genetic Algorithms, Parallel NP-complete Problem Solutions, Parallel Real-time Expert systems, Visualization of Parallel Algorithm Execution, Parallel Discrete-Event Simulation (Battlefield, VHSIC/VHDL), Parallel Electromagnetic Computation, Parallel Computational Fluid Dynamics (Aircraft, Ground Water Contaminants), Software Engineering for Client-Server Systems, Distributed Memory Cache Performance Evaluation, Parallel Wavelets, Distributed Information subsystems in the Joint Battlespace Info-sphere, and many others.

The technology we are developing is a broad spectrum of parallel and distributed systems for use in Command, Control, Communications, Computing, Intelligence, Surveillance, and Reconnaissance (C4ISR).

Parallel and distributed algorithms are used to manage the information grid; retrieve, filter, and summarize information; provide intelligent user interfaces; and include potential application areas such as defined by the AF Joint Battlespace Info-sphere effort shown below.



Courses supporting this interdisciplinary area with emphasis on parallel and distributed computing include CSCE656, CSCE657 and CSCE790. Topics range from problem domain parallel decomposition, distributed algorithm design, and information visualization to the use of MPI, JAVA RMI, DCOM and CORBA for a quite a large variety of applications. Other courses supporting specific problem domains are indicated in departmental course catalogs. As part of course work and research, we have constructed an integrated pile of PCs into a relatively large “Beowulf” cluster running current Linux and Windows operating systems. Also, the use of the WPAFB Major Share Resource Center (MSRC) computing facilities permits us to large state-of-the-art platforms such as the IBM SP3 and SGI Origin 2000 massively parallel systems.

Our interdisciplinary research encompasses the mathematical modeling of parallel and distributed algorithms as well as their analysis as applied to a vast spectrum of military information system applications through extensive statistical testing.

Additional department researchers include:

- **Professor Andrew Terzuoli**
(modeling and simulation of electromagnetic systems)
- **Professor Tim Jacobs**
(visualization and monitoring for high performance parallel and distributed computing systems)

Interdepartmental

- Professors from other departments also support this area through their interdisciplinary efforts:

HPC Computational Fluid Flow
HPC Material Science
Parallel Simulation